IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appellants:	Borran, *et al.*
Title:	METHOD AND APPARATUS TO ESTABLISH CONSTELLATIONS FOR IMPERFECT CHANNEL STATE INFORMATION AT A RECEIVER
Appl. No.:	10/523,167
Filing Date:	3/10/2006
Examiner:	Kevin Michael Burd
Art Unit:	2611
Confirmation Number:	8220

BRIEF ON APPEAL

Mail Stop Appeal Brief - Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir/Madam:

This Appeal Brief is being filed in response to a Notice of Panel Decision from Pre-Appeal Brief Review dated March 25, 2010, rejecting pending Claims 26-53. The Notice of Panel Decision from Pre-Appeal Brief Review was prepared in response to a Notice of Appeal and Pre-Appeal Brief dated January 15, 2010. Based on this, the submission of this Appeal Brief under the provisions of 37 C.F.R. § 41.37 is due April 25, 2010. As a result, this Appeal Brief is being filed together with a credit card payment form covering the 37 C.F.R. 41.20(b)(2) appeal fee of $540.00. A petition for a one month extension of time (EOT) and the appropriate 1-mo EOT fee is also being filed with this Appeal Brief. If the fees are deemed to be insufficient, authorization is hereby given to charge any deficiency (or credit any balance) to the undersigned deposit account 19-0741.

Appellants respectfully request reconsideration of the Application.

REAL PARTY IN INTEREST

The real party in interest is Spyder Navigations L.L.C., the assignee of record, having a place of business at 1209 Orange Street, Wilmington, Delaware 19801 USA. The assignment to Spyder Navigations L.L.C. was recorded in the records of the United States Patent and Trademark Office at Reel/Frame 019893/0540 on September 28, 2007.

RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences that will directly affect, be directly affected by, or have a bearing on the present appeal, that are known to Appellants or Appellants' patent representative.

STATUS OF CLAIMS

The present appeal is directed to Claims 26-53, all of which stand rejected pursuant to a Final Office Action dated October 15, 2009. Claims 1-25 have been canceled. Claims 26-53 are pending and are being appealed. Claims 1-53 with the appropriate status reference are shown in the attached Claims Appendix.

STATUS OF AMENDMENTS

A Final Office Action dated October 15, 2009 was received by Appellants. An After Final Response was filed December 15, 2009. In the After Final Response, no claims were amended. Claims 1-25 had been canceled previously. In the Advisory Action dated December 31, 2009, the Examiner maintained the finality of the office action and the rejection of Claims 26-53. No amendments have been made in the present Application subsequent to receipt of the Final Office Action dated October 15, 2009.

SUMMARY OF CLAIMED SUBJECT MATTER

Seven independent claims, Claims 26, 35, 46, 47, 49, 51, and 53, are under appeal and argued below as a group.

Claim 26 is directed to a method for processing a received signal. The method comprises:

selecting a signal constellation, at a communication device, based on a channel estimation error (e.g. 108, Fig. 1; 600, Fig. 6; 600E, Fig. 6; 708, Fig. 7B; pg. 11, ln. 9 - pg. 13, ln. 27; pg. 14, ll. 18-20);

receiving a modulated signal at a receiver of the communication device (e.g. 100, Fig. 1; 600A, Fig. 6; 706, Fig. 7B; pg. 5, ln. 20 - pg. 6, ln. 6; pg. 6, ll. 11-30; pg. 13, ln. 28 - pg. 14, ln. 10; pg. 14, ln. 18); and

demodulating the modulated signal at a detector module of the communication device by selecting a point from the selected signal constellation corresponding to the modulated signal (e.g. 108, Fig. 1; 600, Fig. 6; 710, Fig. 7B; pg. 14, ll. 20-23).

Claim 35 is directed to a network element. The network element comprises:

a receiver module corresponding to an antenna, wherein the receiver module is configured to receive a modulated signal from a second network element (e.g. 100, Fig. 1; 600A, Fig. 6; 706, Fig. 7B; pg. 5, ln. 20 - pg. 6, ln. 6; pg. 6, ll. 11-30; pg. 13, ln. 28 - pg. 14, ln. 10; pg. 14, ln. 18); and

a detector module configured to select a signal constellation based on a channel estimation error (e.g. 108, Fig. 1; 600, Fig. 6; 600E, Fig. 6; 708, Fig. 7B; pg. 11, ln. 9 - pg. 13, ln. 27; pg. 14, ll. 18-20) and to demodulate the modulated signal by selecting a point from the signal constellation corresponding to the modulated signal (e.g. 108, Fig. 1; 600, Fig. 6; 710, Fig. 7B; pg. 14, ll. 20-23).

Claim 46 is directed to a network element. Claim 46 is a means plus function claim as permitted by 35 U.S.C. 112, ¶ 6. The network element comprises:

means for receiving a modulated signal from a second network element (e.g. 100, Fig. 1; 101, Fig. 1; 600A, Fig. 6; 706, Fig. 7B; pg. 5, ln. 20 - pg. 6, ln. 6; pg. 6, ll. 11-30; pg. 13, ln. 28 - pg. 14, ln. 10; pg. 14, ln. 18);

means for selecting a signal constellation based on a channel estimation error (e.g. 108, Fig. 1; 600, Fig. 6; 600E, Fig. 6; 708, Fig. 7B; pg. 11, ln. 9 - pg. 13, ln. 27; pg. 14, ll. 18-20); and

means for demodulating the modulated signal by selecting a point from the signal constellation corresponding to the modulated signal (e.g. 108, Fig. 1; 600, Fig. 6; 710, Fig. 7B; pg. 14, ll. 20-23).

Claim 47 is directed to a detection module. The detection module comprises:

an input component configured to receive a signal (e.g. 106, 106a, Fig. 1; pg. 6, ll. 5-6; pg. 6, ll. 11-24); and

a detection component configured to select a signal constellation based on a channel estimation error (e.g. 108, Fig. 1; 600, Fig. 6; 600E, Fig. 6; 708, Fig. 7B; pg. 11, ln. 9 - pg. 13, ln. 27; pg. 14, ll. 18-20) and to demodulate the received signal by selecting a point from the signal constellation corresponding to the received signal (e.g. 108, Fig. 1; 600, Fig. 6; 710, Fig. 7B; pg. 14, ll. 20-23).

Claim 49 is directed to a computer-readable medium having computer-readable instructions stored thereon that, when executed by a processor, cause a computing device to:

receive a modulated signal (e.g. 100, Fig. 1; 101, Fig. 1; 600A, Fig. 6; 706, Fig. 7B; pg. 5, ln. 20 - pg. 6, ln. 6; pg. 6, ll. 11-30; pg. 13, ln. 28 - pg. 14, ln. 10; pg. 14, ln. 18);

select a signal constellation based on a channel estimation error (e.g. 108, Fig. 1; 600, Fig. 6; 600E, Fig. 6; 708, Fig. 7B; pg. 11, ln. 9 - pg. 13, ln. 27; pg. 14, ll. 18-20); and

demodulate the modulated signal by selecting a point from the signal constellation corresponding to the modulated signal (e.g. 108, Fig. 1; 600, Fig. 6; 710, Fig. 7B; pg. 14, ll. 20-23).

Claim 51 is directed to a method for communicating a signal. The method comprises:

selecting a point from a signal constellation at a selection module based on a channel estimation error (e.g. 108, Fig. 1; 600, Fig. 6; 600E, Fig. 6; 702, Fig. 7A; pg. 11, ln. 9 - pg. 13, ln. 27; pg. 14, ll. 18-20);

modulating the signal at a modulator using the selected point (e.g. 108, Fig. 1; 600, Fig. 6; 704, Fig. 7A; pg. 5, ll. 5-10; pg. 6, ll. 7-15); and

transmitting the modulated signal from a first network element to a second network element (e.g. 100, Fig. 1; 101, Fig. 1; 600A, Fig. 6; 704, Fig. 7A; pg. 14, ln. 11).

Claim 53 is directed to a network element. The network element comprises:

a selection module configured to select a point from a signal constellation based on a channel estimation error (e.g. 108, Fig. 1; 600, Fig. 6; 600E, Fig. 6; 702, Fig. 7A; pg. 11, ln. 9 - pg. 13, ln. 27; pg. 14, ll. 18-20);

a modulator configured to modulate the signal using the selected point (e.g. 108, Fig. 1; 600, Fig. 6; 704, Fig. 7A; pg. 5, ll. 5-10; pg. 6, ll. 7-15); and

a transmitter configured to transmit the modulated signal to a second network element (e.g. 100, Fig. 1; 101, Fig. 1; 600A, Fig. 6; 704, Fig. 7A; pg. 14, ln. 11).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

One ground of rejection is presented for review in this appeal:

1) The rejection of Claims 26, 35, 46, 47, 49, 51, and 53 under 35 U.S.C. § 102(e) as being unpatentable over U.S. Patent No. 6,560,445 to Fette *et al.* (*Fette*).

ARGUMENT

I. LEGAL STANDARDS UNDER 35 U.S.C. 102(e)

35 U.S.C. § 102(e) provides that "a person shall be entitled to a patent unless ... the invention was described in - (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the Appellant for patent." A prior art reference, as defined by 35 U.S.C. 102, is said to "anticipate" a claimed invention if each and every <u>element</u> of the claimed invention is disclosed, either expressly or inherently, in the prior art reference. *In re Spada*, 911 F.2d 705, 708, 15 U.S.P.Q.2d 1655, 1657 (Fed. Cir. 1990). In deciding the issue of anticipation, one must identify the elements of the claims, determine their meaning in light of the specification and prosecution history, and identify corresponding elements disclosed in the allegedly anticipating reference. *Lindemann Maschinenfabrik v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1458, 221 U.S.P.Q. 481, 485-86 (Fed. Cir. 1984).

The Federal Circuit explained the requirements for anticipation in *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 218 U.S.P.Q. 781 (Fed. Cir. 1983), by stating:

> The law of anticipation does not require that the reference "teach" what the subject patent teaches. Assuming that a reference is properly "prior art," it is only necessary that the claims under attack, as construed by the court, "read on" something disclosed in the reference, i.e., all limitations of the claim are found in the reference, or "fully met" by it.

Id. at 772, 218 U.S.P.Q. at 789.

Extrinsic evidence from those skilled in the art can be used to explain, but not to expand the meaning of a disclosed element in that single prior art reference, to determine

whether the reference anticipates the claims at issue. *In re Baxter Travenol Labs.*, 952 F.2d 388, 21 U.S.P.Q.2d 1281 (Fed. Cir. 1991).

II. REJECTION OF CLAIMS 26, 35, 46, 47, 49, 51, and 53 UNDER 35 U.S.C. 102(e)

In section 6 of the Final Office Action, Claims 26, 27, 30, 31, 35, 36, 39, 40, 44-49, and 51-53 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,560,445 to Fette *et al.* (*Fette*). Appellants disagree and submit that *Fette* fails to teach, suggest, or disclose all of the elements of at least independent Claims 26, 35, 46, 47, 49, 51, and 53.

Claim 26 recites in part "selecting a signal constellation, at a communication device, based on a channel estimation error." Claims 35, 46, 47, 49, 51, and 53, though of different scope, recite a similar feature.

On pages 4-5 of the Final Office Action, the Examiner states:

> The signal to noise ratio (SNR) of each coefficient is used to determine the constellation that will be used for transmission (column 8, lines 20-51). The <u>SNR is an estimation of the quality of the channel</u> used for communication. The <u>channel quality is a channel estimation</u> and <u>errors in the channel quality (a reduced level of channel quality) represent channel estimation errors</u>. The level of the signal is determined as is the level of the noise present in the channel to determine a signal-to-noise-ratio (SNR). The <u>noise or distortion present in the communication channel is a channel estimation error since the noise or distortion represents errors in the channel</u>. When little or no distortion is detected, the error is minimized and the signal is transmitted with minimal interference.

(Underlining added). First, Appellants fail to follow the Examiner's logic as to how the SNR can be related to "a channel estimation error," which it cannot. Even if the relationships drawn by the Examiner were true, which Appellants do not concede, the Examiner's logic does not arrive at a relationship that equates the SNR to "a channel estimation error." The Examiner's logic is first, SNR->channel quality->channel estimation. The Examiner's logic is next, errors in channel quality->channel estimation errors. Thus, the Examiner comes to the

unremarkable conclusion that errors represent errors, but fails to indicate a basis for equating the SNR to "a channel estimation error."

Second, Appellants respectfully disagree with the Examiner's statement that "noise or distortion present in the communication channel is a channel estimation error since the noise or distortion represents errors in the channel." Noise and distortion are two different signal parameters, and noise does not represent *errors* in the channel. Noise effects the ability to detect the signal, and is not itself "a channel estimation error." There further may be a ***general statistical*** relationship between noise and error. For example, a low noise and distortion environment ***may*** result in a lower error ***on average***. However, again, the SNR is not itself nor can it be equated to "a channel estimation error." As with any statistical variation, a high noise environment ***may*** result in a low channel estimation error. Thus, the SNR ***cannot*** be equated to "a channel estimation error" as the Examiner repeatedly and incorrectly argues.

At column 8, lines 20-51, cited by the Examiner, *Fette* states:

> In the simulation, all cepstral coefficients are modulated with random noise, ranging over the values -1 to +1. This may be performed one coefficient at a time or in multiples of coefficients or even all coefficients, each with independent noise. The simulation of many baud of communication is performed (assume at least 10 times the number of bits to be delivered under these conditions). The receive simulation decodes and recovers the cepstral coefficients, which can now be correlated with those coefficients transmitted. <u>This correlation now provides evidence of the signal to noise ratio (SNR) of each cepstral coefficient and its ability to convey information</u>. This process will also produce a model of how the various forms of interference degrade or offset the cepstral coefficients. Also, certain types of interference may be detected and eliminated by recognizing that a certain cepstral coefficient was always modulated to be zero and that, by receiving as non-zero, the location of interference may be recovered in the spectrum and its artifact removed.
>
> Modulation constellations for cepstrum can be one-dimensional (scalar) as shown in FIG. 7, two-dimensional (as is done in quadrature modulation) and as is shown in FIG. 8, three-dimensional as shown in FIG. 9, or higher. <u>In principle, for very high SNR situations, all dimensions of cepstrum could</u>

> be modulated with a very high dimensionality table. If we choose to create two or three-dimensional modulation constellations for cepstral coefficients, we can also choose which coefficients to cluster together in sets of two or three. They need not be consecutive. As in prior systems, the ability of a signal to deliver Boolean information is a function of the signal to noise ratio of the communications channel.

(Underlining added). Thus, the cited section of *Fette* teaches a relationship between SNR and the ability of a signal to deliver Boolean information; however, the cited section of *Fette* teaches nothing whatsoever related to "selecting a signal constellation, at a communication device, based on a channel estimation error" as recited in independent Claim 26, and similarly recited in Claims 35, 46, 47, 49, 51, and 53. To the contrary, according to *Fette,* the constellation is selected by identifying a SNR in the created "table or set of tables" (col. 9, ll. 46-47) that is closest to the actual received SNR. As stated previously, the SNR is ***not*** a channel estimation error. The SNR is a measure of the signal power to the noise power, neither of which is an ***error***. Therefore, *Fette* fails to provide any teaching of at least "selecting a signal constellation, at a communication device, based on a channel estimation error" as recited in independent Claim 26, and similarly recited in Claims 35, 46, 47, 49, 51, and 53.

Appellants also respectfully point out that Claims 27, 36, and 52 recite "wherein the signal constellation is further selected ***based on a signal to noise ratio***." (Emphasis added). Thus, based on claim differentiation, "a channel estimation error" is distinguishable from "a signal to noise ratio" or Claims 27, 36, and 52 would not narrow Claims 26, 35 and 51, respectively, and the claims would not recite "***further*** selected."

As shown in Fig. 6 of the present application reproduced below, the SNR is distinct from either the channel estimate or the statistics of the estimation error. Therefore, the SNR is ***not*** a channel estimation error based on the plain language of the claim and as fully supported by the specification of the present application.

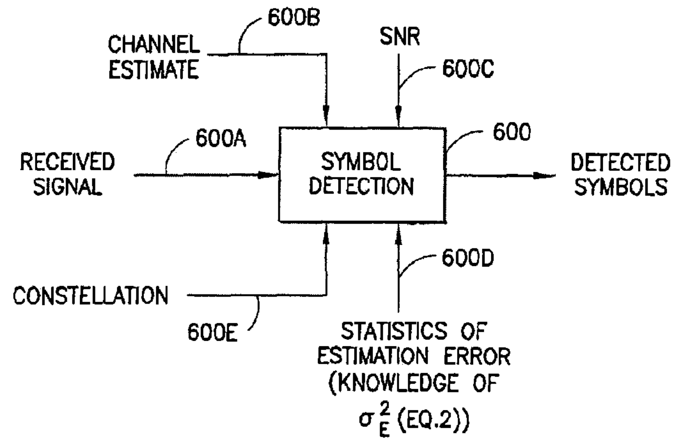

FIG.6

For at least these reasons, Appellants respectfully submit that *Fette* fails to teach, suggest, or describe all of the elements recited in at least independent Claims 26, 35, 46, 47, 49, 51, and 53. A rejection under 35 U.S.C. § 102 cannot be properly maintained where the reference fails to teach each and every element of the rejected claims. The remaining claims depend from one of Claims 26, 35, 47, or 51. Thus, for at least this reason, Appellants respectfully request withdrawal of the rejection of Claims 26-53.

In section 7 of the Final Office Action, Claims 28, 29, 37, and 38 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Fette* in view of U.S. Patent Publication No. 2002/0090035 to Seshadri *et al.* (*Seshadri*). *Seshadri* fails to remedy the deficiencies of *Fette*.

Seshadri describes a method "used to generate set partitioning structures and trellis structures that enable code designers to systematically design the codes of the invention." (Abstract). *Seshadri* states:

> Once the rate has been selected, other aspects of the communications system and code are fixed. For example, a rate of 1 bit/second/hertz means that the system will have a constellation size of 2 (a BPSK system). A rate of 2 bits/second/hertz means the system will have a constellation size of 4 (a QPSK system). A rate of 3 bits/second/hertz means that the system will have a constellation size of 8 (an 8-PSK system). In general, the constellation size (L) will equal 2.sup.b, where b represents the selected rate. Also, as described herein, once the rate is selected, the number of input bits provided to lookup table 506 is 2b. Thus, selecting a rate is an important design consideration.

(Para. [0083]; underlining added). Thus, according to *Seshadri*, the constellation can be selected based on a rate where the "selected rate represents the number of bits transmitted in a given period of time." (Para. [0082]). However, *Seshadri* fails to provide any teaching of at least "selecting a signal constellation, at a communication device, based on a channel estimation error" as recited in independent Claim 26, and similarly recited in Claim 35.

In section 8 of the Final Office Action, Claims 32, 41, and 50 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Fette* in view of Dabak *et al.*, "Signal Constellations for Non-Gaussian Communication Problems", Proceedings of the 1993 IEEE International Conference on Acoustics, Speech, and Signal Processing, April 27-30, 1993, Minneapolis, Minnesota, 33-36 (*Dabak*). *Dabak* fails to remedy the deficiencies of *Fette*.

Dabak describes a "procedure for determining optimum signal sets." (Abstract). *Dabak* states that "[o]ptimum signal constellations depend on signal-to-noise ratio." (Abstract). *Dabak* further states that "[f]or small M, we can calculate optimal signal sets by maximizing the sum of all intersignal distance measures under a signal-related constraint." (Page 34, Section 3). However, *Dabak* fails to provide any teaching of at least "selecting a signal constellation, at a communication device, based on a channel estimation

error" as recited in independent Claim 26, and similarly recited in Claims 35 and 49. Again, the SNR is ***not*** a channel estimation error.

In section 9 of the Final Office Action, Claims 33, 34, 42, and 43 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Fette* in view of U.S. Patent No. 6,674,820 to Hui *et al.* (*Hui*). *Hui* fails to remedy the deficiencies of *Fette*.

Hui describes a method "in which, over each synchronization signal period or other determinate information window, the channel coefficients and the color of the baseband noise are concurrently estimated." (Abstract). *Hui* states:

> To extract the transmitted signal (or symbols) from the received signal, the receiver of a mobile terminal typically includes a demodulator which may be a coherent demodulator such as a maximum likelihood sequence estimation (MLSE) demodulator (or equalizer). To adapt to the channel variation from each data burst to the next, an associated channel estimator is typically provided for the demodulator. The channel estimator typically operates using known transmitted symbols.

(Col. 1, ll. 57-65). However, *Hui* fails to provide any teaching of at least "selecting a signal constellation, at a communication device, based on a channel estimation error" as recited in independent Claim 26, and similarly recited in Claim 35.

Thus, *Fette, Seshadri, Dabak,* and *Hui*, alone and in combination, fail to teach, suggest, or disclose all of the elements of at least independent Claims 26, 35, 46, 47, 49, 51, and 53. As a result, Appellants respectfully request withdrawal of the rejection of Claims 26-53.

CONCLUSION

In view of the foregoing discussion and arguments, Appellants respectfully submit that Claims 26-53 are not properly rejected under 35 U.S.C. § 103(a) as being unpatentable over *Fette* alone or in combination with any of *Seshadri, Dabak,* and *Hui.* Accordingly, Appellants respectfully request that the Board reverse all claim rejections and indicate that a Notice of Allowance respecting all pending claims should be issued.

Respectfully submitted,

Date: April 27, 2010

By:

Paul S. Hunter
Attorney for Appellant
Registration No. 44,787

FOLEY & LARDNER LLP
Customer Number: 23524
Telephone: (608) 258-4292
Facsimile: (608) 258-4258

CLAIMS APPENDIX

1.-25. (Canceled)

26. (Previously Presented, Appealed) A method for processing a received signal, the method comprising:

selecting a signal constellation, at a communication device, based on a channel estimation error;

receiving a modulated signal at a receiver of the communication device; and

demodulating the modulated signal at a detector module of the communication device by selecting a point from the selected signal constellation corresponding to the modulated signal.

27. (Previously Presented, Appealed) The method of claim 26, wherein the signal constellation is further selected based on a signal to noise ratio.

28. (Previously Presented, Appealed) The method of claim 26, wherein the modulated signal is received by multiple receive antennas.

29. (Previously Presented, Appealed) The method of claim 26, further comprising decoding the demodulated signal using an outer code that includes codes over a plurality of signal matrices across time.

30. (Previously Presented, Appealed) The method of claim 26, further comprising transmitting an indication of a current signal to noise ratio from the communication device to a second communication device.

31. (Previously Presented, Appealed) The method of claim 26, further comprising storing a plurality of signal constellations in a memory of the communication device.

32. (Previously Presented, Appealed) The method of claim 26, wherein the signal constellation is designed based on a minimum Kullback-Leibler distance between signal constellation points.

33. (Previously Presented, Appealed) The method of claim 26, wherein demodulating the modulated signal comprises performing maximum likelihood demodulation.

34. (Previously Presented, Appealed) The method of claim 26, wherein the demodulating the modulated signal comprises performing coherent demodulation.

35. (Previously Presented, Appealed) A network element comprising:

a receiver module corresponding to an antenna, wherein the receiver module is configured to receive a modulated signal from a second network element; and

a detector module configured to select a signal constellation based on a channel estimation error and to demodulate the modulated signal by selecting a point from the signal constellation corresponding to the modulated signal.

36. (Previously Presented, Appealed) The network element of claim 35, the detector module is further configured to select the signal constellation based on a signal to noise ratio.

37. (Previously Presented, Appealed) The network element of claim 35, further comprising multiple receiver modules corresponding to multiple receive antennas, wherein the multiple receiver modules are configured to receive the modulated signal.

38. (Previously Presented, Appealed) The network element of claim 35, wherein the detector module is further configured to decode the demodulated signal using an outer code that includes codes over a plurality of signal matrices across time.

39. (Previously Presented, Appealed) The network element of claim 35, further comprising a transmit module configured to transmit an indication of a current signal to noise ratio.

40. (Previously Presented, Appealed) The network element of claim 35, further comprising a memory configured to store the signal constellation in a look-up table.

41. (Previously Presented, Appealed) The network element of claim 35, wherein the signal constellation is designed based on a largest minimum Kullback-Leibler distance between signal constellation points.

42. (Previously Presented, Appealed) The network element of claim 35, wherein the detector module is further configured to perform maximum likelihood demodulation.

43. (Previously Presented, Appealed) The network element of claim 35, wherein the detector module is further configured to perform coherent demodulation.

44. (Previously Presented, Appealed) The network element of claim 35, wherein the network element comprises part of a base station or a mobile station.

45. (Previously Presented, Appealed) The network element of claim 35, wherein the detector module is configured to receive the channel state information and the signal constellation.

46. (Previously Presented, Appealed) A network element comprising:

means for receiving a modulated signal from a second network element;

means for selecting a signal constellation based on a channel estimation error; and

means for demodulating the modulated signal by selecting a point from the signal constellation corresponding to the modulated signal.

47. (Previously Presented, Appealed) A detection module comprising:

an input component configured to receive a signal; and

a detection component configured to select a signal constellation based on a channel estimation error and to demodulate the received signal by selecting a point from the signal constellation corresponding to the received signal.

48. (Previously Presented, Appealed) The detection module of claim 47, wherein the input component is further configured to receive the channel estimation error, a signal-to-noise ratio, and the signal constellation.

49. (Previously Presented, Appealed) A computer-readable medium having computer-readable instructions stored thereon that, when executed by a processor, cause a computing device to:

receive a modulated signal;

select a signal constellation based on a channel estimation error; and

demodulate the modulated signal by selecting a point from the signal constellation corresponding to the modulated signal.

50. (Previously Presented, Appealed) The computer-readable medium of claim 49, wherein the signal constellation is designed based on a largest minimum Kullback-Leibler distance between signal constellation points.

51. (Previously Presented, Appealed) A method for communicating a signal, the method comprising:

selecting a point from a signal constellation at a selection module based on a channel estimation error;

modulating the signal at a modulator using the selected point; and

transmitting the modulated signal from a first network element to a second network element.

52. (Previously Presented, Appealed) The method of claim 51, wherein selecting the point from the signal constellation is further based on a signal-to-noise ratio.

53. (Previously Presented, Appealed) A network element comprising:

a selection module configured to select a point from a signal constellation based on a channel estimation error;

a modulator configured to modulate the signal using the selected point; and

a transmitter configured to transmit the modulated signal to a second network element.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.